

2013

Development of a Game-Based-Learning App for Exposing Students to Chemistry and Life Science as a Research Endeavor

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Recommended Citation

Silva, Thanuci; Galembeck, Eduardo; Pelaez, Nancy; and Anderson, Trevor R., "Development of a Game-Based-Learning App for Exposing Students to Chemistry and Life Science as a Research Endeavor" (2013). *PIBERG Presentations*. Paper 2.
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Development of a Game-Based-Learning App for exposing students to chemistry and life science as a research endeavor

ABSTRACT

We have developed a gamified Virtual Learning Environment (VLE), called 3DClass, to deliver homework to chemistry and life science students through a user-friendly and enjoyable interface. Homework from four courses was delivered using the 3DClass, a computer app that acts as an interface between Moodle and the Apple Game Center. This App allows users to play while learning or to learn while playing. The results show that this App can be used in a flexible manner with designs that can be customized to courses with different characteristics, such as with online collaboration or face-to-face lectures, and for participant numbers that vary for courses with 20 to 600 students. The design accommodates the delivery of quizzes, and 3DClass also allows students to compete with each other for achievements in the Apple Game Center. It can deliver video, images, and promote student interactions using a forum. The Open Quizzes can be taken without being registered in any of the courses and anyone can download the 3DClass App without cost.

BACKGROUND: Educational technologies are present in students' lives. Research shows the importance of the software user interface in the students' learning, and the need for approaching the cognitive theories behind the improvement of the learning process (Mayer, 2002).

Problem:
Bring real classroom features to a mobile application in order to produce a virtual learning environment.

Context:

- 1) Students have been in touch with a large number of portable devices.
- 2) New technologies allow the improvement of teaching strategies.
- 3) Professors have problems identifying student difficulties.

Instructional Design:

- 1) Based on game design
- 2) Flexible for use in different classes
- 3) Promotes Collaboration
- 4) Promotes problem solving

Allows for Assessment

- 1) Science knowledge
- 2) Student motivation
- 3) Student difficulties
- 4) Multiple ways of reporting performance

Development:

- 1) Reproduce real classroom features
- 2) Store class content (images, videos, discussion forums, homework)
- 3) Evaluate students difficulties

Enact:

- 1) Real Classroom testing
- 2) Multiple opportunities for students to test their knowledge
- 3) Users worldwide playing and scoring on a Leaderboard

Evaluation:

- 1) Apple Game Center data (Leaderboard)
- 2) Student Reports Center

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3D Class app

Open quizzes provide questions for games to entice students to take a challenging science course.

Professors and the students who are taking the course are able to visualize content and student information is kept private.

3D Class for students

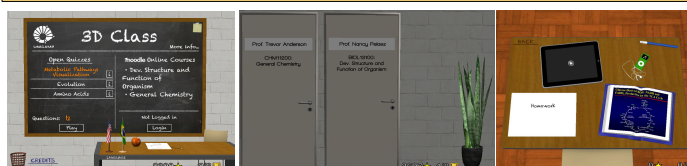


Figure 1: 3D Class screens showing the main screen and the entry into Online Courses and homework assignments

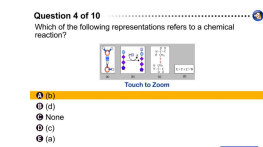


Figure 2: 3D Class screens showing a question



Figure 3: Apple Game Center screen shots. Pictures were captured on 4 different days in a week. The shaded names show students competing for the leader position.

3D Class for professors

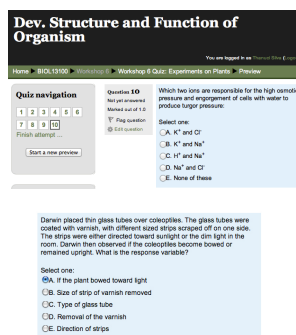


Figure 4: Moodle quiz interface for professors to create their own questions.

Figure 5: Results are displayed to make it easy to assess student difficulties on weekly topics.

On 3D Class all these data are generated automatically and organized in tables.

Table 1: Player scores.

TRY	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SCORE
13 Jan 07:15 PM	10	10	10	0	10	0	0	0	0	0	40
13 Jan 10:39 PM	10	10	10	0	10	0	0	0	0	0	40
14 Jan 07:21 PM	10	10	10	10	10	0	0	0	0	0	50
14 Jan 09:21 PM	10	10	10	10	10	0	0	0	0	0	50
14 Jan 12:44 PM	10	10	10	10	10	0	0	0	0	0	50
15 Jan 01:28 PM	10	10	10	10	10	0	0	0	0	0	50
15 Jan 07:23 PM	10	10	10	0	10	0	0	0	0	0	40
15 Jan 08:24 PM	10	10	10	10	10	0	0	0	0	0	50
7 Feb 03:29 PM	10	10	10	10	10	10	10	0	10	10	90
7 Feb 03:39 PM	10	10	10	10	10	10	10	10	10	10	100

Table 2: Player attempts.

TIMES PLAYED	AVERAGE SESSION TIME	AVERAGE SCORE
145	00:01:46	92.28
97	00:01:26	93.30
84	00:01:01	77.98
77	00:01:44	94.81
76	00:00:46	97.89
67	00:00:51	95.52

Conclusions and Implications

- ◆ The 3D Class system functions well in large or small enrollment classes.
- ◆ 3D Class makes it possible to have students manipulate multi-media and visual representations.
- ◆ Results show professors in real time which questions are giving students the most difficulty.
- ◆ Instructors can address the difficulties in lecture or homework assignments before it is too late.
- ◆ 3D Class makes it easy for students to collaborate and discuss homework questions.
- ◆ Some students are motivated to work at improving their answers whereas other students continue to guess at answers to multiple choice questions and they fail to improve.

ACKNOWLEDGEMENTS

We specially thanks to Rodrigo Takase, Educational Technology Lab (LTE) apps development team head. We would like to thank the São Paulo Research Foundation (FAPESP), and The National Council for Scientific and Technological Development (CNPq) for their financial support of work on this project.

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or visit 3dclass-app.com

